//////InnoSenT
Innovative Sensor Technology

Installation Manual   IVS-947

Version 1.3 - 02.05.2019

designed and manufactured in Germany

PRODUCT FAMILY	K-Band Transceiver

APPLICATIONS	• Traffic Monitoring
	• Industrial Applications

■ Movement
■ Velocity
■ Direction
■ Presence
■ Distance
□ Angle

FEATURES:

» K-Band VCO Transceiver with advanced SiGe MMIC technology
» supports CW / FSK / FMCW modes
» RF prescaler divider ratio 8192
» I/Q channels for direction of motion discrimination
» RF LNA for high SNR
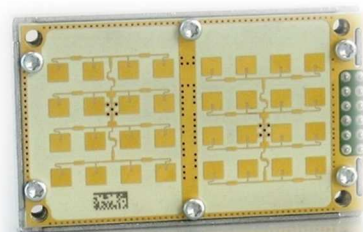
DESCRIPTION

The IVS-947 provides an advanced 24GHz MMIC Design. The module can be used in CW / FSK / FMCW-mode. This design includes an RF prescaler for transmit frequency reference. The prescaler output is 2.94MHz.

CERTIFICATES

InnoSenT GmbH has established and applies a quality system for: development, production and sales of radar sensors for industrial and automotive sensors.

Qualitätsmanagement ISO/TS 16949 ▶ Regelmäßige freiwillige Überwachung — DEKRA Certification — DEKRA zertifiziert

Qualitätsmanagement ISO 9001:2008 ▶ Regelmäßige freiwillige Überwachung — DEKRA Certification — DEKRA zertifiziert

Umweltmanagement ISO 14001 ▶ Regelmäßige freiwillige Überwachung — DEKRA Certification — DEKRA zertifiziert

ADDITIONAL INFORMATION

InnoSenT Standard Product. Changes will not be notified as long as there is no influence on form, fit and within this data sheet specified function of the product.

RoHS-INFO

This product is compliant to the restriction of hazardous substances (RoHS - European Union directive 2011/65/EU).

InnoSenT
Innovative Sensor Technology

ELECTRICAL CHARACTERISTICS

PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNITS
Transmitter						
transmit frequencies	delivery conditions	$f_{IVS-947}$	24.000		24.250	GHz
varactor tuning voltage		V_{tune}	0.7		2.5	V
varactor input impedance				10k		Ω
tuning slope				720	2000	MHz/V
temperature drift (frequency)	-40°C...+85°C	$\Delta f_{-40°C...+85°C}$		-4.6		MHz/°C
output power (EIRP)	@ 25°C	P_{out}		19	20	dBm
power drift over temp.		ΔP_{temp}		-0.01		dB/°C
Receiver						
|I/Q| balance		amplitude	-1.5	0	1.5	dB
		phase	70	90	110	°
IF-output		voltage offset		1.65		V
self clutter [1]					±0.4	Vpp

[1] self clutter is the signal measured at the IF output (without enclosure) due to modulation when no target is present.

Antenna System Pattern (compare with antenna plot on page 4)

full beam width @ -3dB	azimuth	horizontal		33		°
	elevation	vertical		33		°
full beam width @ -10dB	azimuth	horizontal		59		°
	elevation	vertical		61		°
side-lobe suppression	azimuth	horizontal	20	25		dB
	elevation	vertical	20	25		dB
antenna gain		gain		15		dBi

ELECTRICAL CHARACTERISTICS

PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNITS
Frequency Divider						
Prescaler division ratio				8192		
Prescaler output voltage	Peak to peak voltage Terminated with 50Ω	V_{DIV}	60	120	260	mV
Power supply						
supply voltage		V_{CC}	3.2	3.3	3.4	V
Prescaler supply voltage		$V_{CC\,divider}$	3.2	3.3	3.4	V
supply current		I_{CC}		55	65	mA
Prescaler supply current		I_{CC_DIV}		19		mA
Environment						
operating temperature		T_{OP}	-40		+85	°C
storage temperature		$T_{storage}$	-40		+85	°C
Mechanical Outlines (compare with mechanical outlines on page 5)						
outline dimensions		height length width		9.0 61.6 37.0		mm

TX- ANTENNA PATTERN

Antenna Orientation:

33°

33°
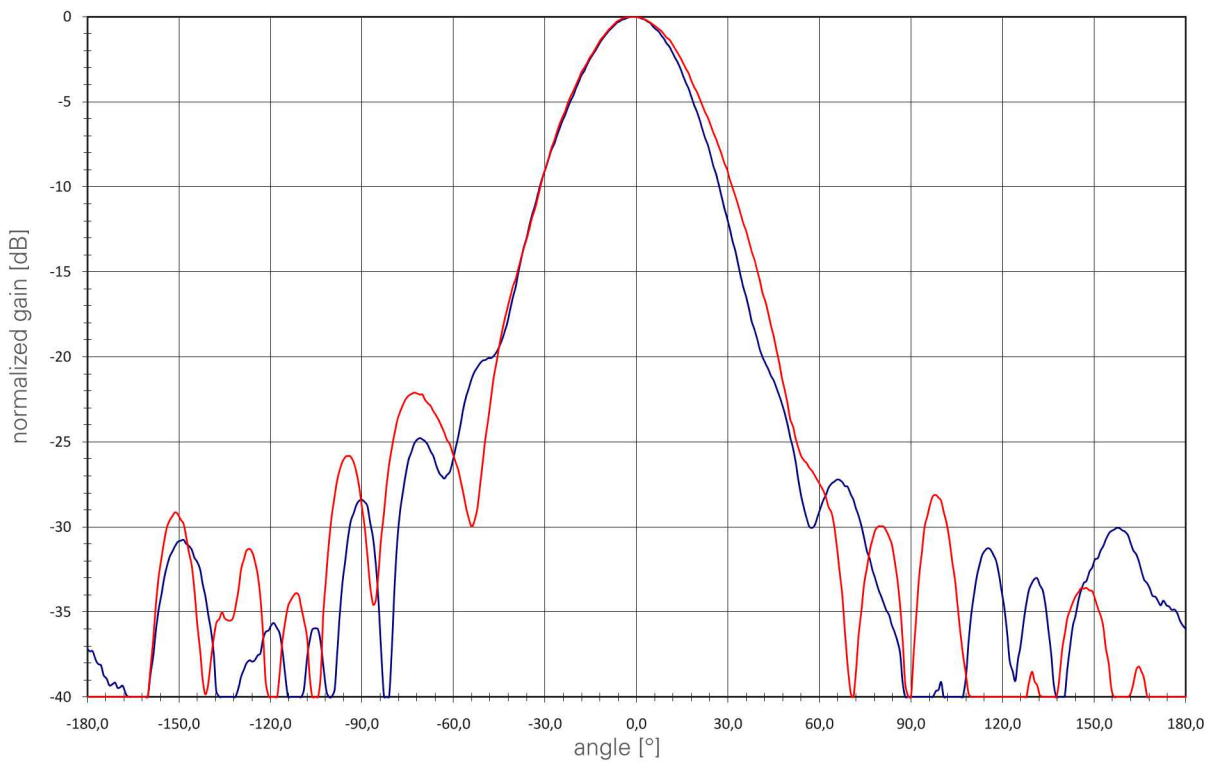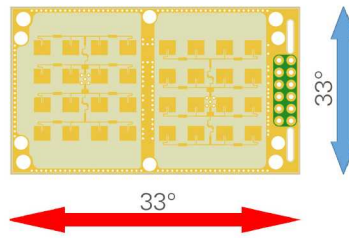
PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNITS
full beam width @ -3dB	azimuth	horizontal		33		°
	elevation	vertical		33		°
full beam width @ -10dB	azimuth	horizontal		59		°
	elevation	vertical		61		°
side-lobe suppression	azimuth	horizontal	20	25		dB
	elevation	vertical	20	25		dB

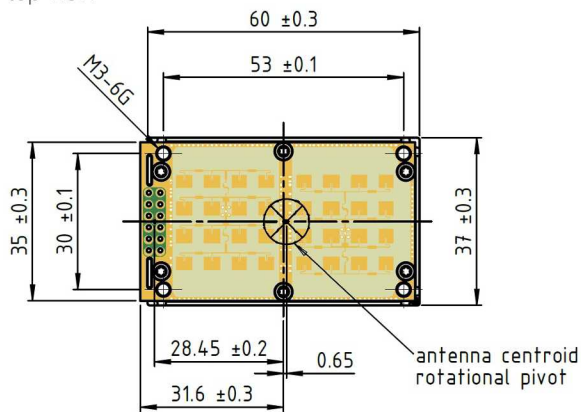## INTERFACE

The sensor provides a 2.5mm grid, single row pin header (square pin $\square$ 0.635mm).

PIN #	DESCRIPTION	IN / OUT	COMMENT
1	TX on		active high / enable TX-power / internally pulled up to +3.3V with 10kOhm / pull down to GND to disable
2	enable	input	active low / enable OSC + LNA / internally pulled up to VCC with 10kOhm / pull down to GND to enable
3	V_{CC}	input	supply voltage +3.3V
4	GND	input	analog ground
5	IF2	output	signal I(nphase)
6	IF1	output	signal Q(uadrature)
7	dnc		do not connect
8	Div_out	output	divider output (Tx / 8192)
9	$V_{CC\,divider}$	input	supply voltage divider +3.3V
10	V_{tune}	input	tuning voltage (0.7...2.5V)
11	dnc		do not connect
12	dnc		do not connect

MECHANICAL OUTLINES

top view

side view
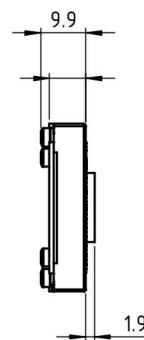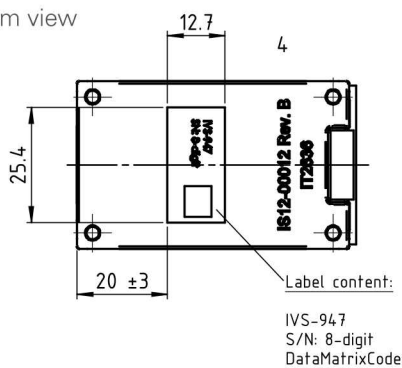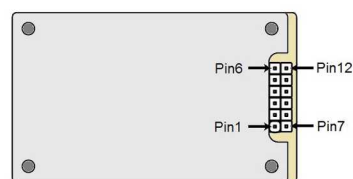
antenna centroid rotational pivot

bottom view

Label content:
IVS-947
S/N: 8-digit
DataMatrixCode

connector view

Changes or modifications made to the equipment not expressly approved by InnoSenT GmbH may void the FCC / IC authorization to operate this equipment.

The use of the transceiver module is authorized in mobile or fixed host devices taking into account the conditions listed below:

• OEM Integrator must ensure that the end user manual may not contain any information about the way to install or remove the module from the final product.

• Depending on the final host device additional authorization requirements for the non-transmitter functions of the transmitter module may be required (i.e., Verification, or Declaration of Conformity) The OEM integrator is responsible for ensuring that after the module is installed and operational the host continues to be compliant with the Part 15B unintentional radiator requirements.

• The information on the label and in the user manual is required to be incorporated in the user manual of the final host. see 47 CFR15 requirements for more details (e.g. 15.19 / 15.21 / 15.101 / 15.105 / RSS-GEN / ICES)

• Additional label with the words 'Contains FCC ID:AAABBBBB' and 'Contains IC:AAAA-BBBB' shall be applied and visible from the outside of the host product.

• The module must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the module.

• The end user manual for the final host product operating with this transmitter must include operating instructions to satisfy RF exposure compliance requirements.

Radiofrequency radiation exposure Information:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 20 cm between the radiator and your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

• When the final host product operating with this transmitter deviate from above, installation of this module into specific final hosts may require the submission of a Class II permissive change application containing data permanent to RF Exposure, spurious emissions, ERP/EIRP, and host/module authentication, or new application if appropriate.

Feel free to contact us if additional guidance is required.

Manual Requirements according 15.19 / RSS-GEN

This device complies with Part 15 of the FCC Rules [and with Industry Canada licence-exempt RSS standard(s)].

Operation is subject to the following two conditions:

(1) this device may not cause harmful interference, and

(2) this device must accept any interference received, including interference that may cause undesired operation.

Manual Requirements according 15.21

Changes or modifications made to this equipment not expressly approved by (manufacturer name) may void the FCC authorization to operate this equipment.

ESD-INFORMATION

This InnoSenT sensor is sensitive to damage from ESD. Normal precautions as usually applied to CMOS devices are sufficient when handling the device. Touching the signal output pins has to be avoided at any time before soldering or plugging the device into a motherboard.

APPROVAL

This Data Sheet contains the technical specifications of the described product. All previous versions of this Data Sheet are no longer valid.

The sensor uses Hydrocarbon based material which may change its dielectric properties when used in an oxidative environment. This may vary based on temperature. Therefore InnoSenT recommends evaluating this influence within the specific environment.

VERSION	DATE	COMMENT
1.0	05.09.2017	initial release
1.1	31.01.2018	remove IF - amplifier
1.2	23.11.2018	Udate electrical characteristics
1.3	05.03.2019	smal changes in interface

InnoSenT GmbH

Am Rödertor 30
97499 Donnersdorf
GERMANY

Tel.:   +49 (0) 9528 - 9518 - 0
E-Mail: info@innosent.de
URL: www.innosent.de